Batch Treatment Work Plan
Topock Compressor Station
Needles, California

Prepared for

Department of Toxic Substances Control

United States Bureau of Land Management

On behalf of

Pacific Gas and Electric Company

April 30, 2004

CH2MHILL

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This work plan was prepared under supervision of a
California Professional Engineer

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Senior Engineer

Contents

Acronyms and Abbreviations

BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CUPA	Certified Unified Program Agency
DTSC	Department of Toxic Substances Control
IMWP	Interim Measures Work Plan
mg/L	Milligrams per liter
O&M	Operations and maintenance
PG&E	Pacific Gas and Electric Company

1.0 Introduction

Pacific Gas and Electric Company (PG&E) is addressing chromium in groundwater at the Topock Compressor Station under the oversight of the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). In a letter dated January 22, 2004, DTSC directed PG&E to prepare an Interim Measures Work Plan (IMWP) to mitigate potential impacts of chromium in groundwater on the Colorado River pursuant to the Section IV.A. of the Corrective Action Consent Agreement between DTSC and PG&E. The DTSC determined that immediate action was required to prevent and/or mitigate potential impacts to the Colorado River pursuant to the Section IV.A. of the Corrective Action Consent Agreement between DTSC and PG&E. Assisting DTSC and PG&E are the members of the Topock Consultative Workgroup, constituted under California's Site Designation Process and consisting of representatives of DTSC, the Colorado River Basin Regional Water Quality Control Board, State Water Resources Control Board, Metropolitan Water District of Southern California, Arizona Department of Environmental Quality, Mohave County Department of Public Health (Arizona), and the various federal agencies, including the Bureau of Land Management (BLM), Bureau of Reclamation, the United States Fish and Wildlife Service, who own or manage land overlying the chromium plume.

By an Action Memorandum dated March 3, 2004, the Arizona State Director of the United States BLM has authorized PG&E to conduct a time-critical removal action encompassing groundwater extraction and other specified activities on BLM-managed property pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). PG&E is currently extracting groundwater and storing it in tanks at the MW-20 bench location. The stored groundwater is transported off-site in trucks (See Section 2.0).

PG&E is requesting approval of BLM to operate a batch treatment system for groundwater extracted from extraction wells TW-2S and TW-2D at the MW-20 bench north of the PG&E Topock Compressor Station in Needles, California. Such treatment will be part of the interim measures now being conducted at the property owned by the Bureau of Reclamation and managed by BLM. PG&E believes that performing such treatment as a component of the interim measures offers significant advantages from logistical and technical perspectives and may help expedite the installation and operation of critical remedial facilities. This treatment system upgrade will cause no significant change in the traffic or the system footprint, a minor visual change, and greater than a 99 percent reduction in the volume of hazardous waste generated at the BLM groundwater extraction site.

Treatment of extracted groundwater at the MW-20 bench location in existing tanks, and the transport of that water from this location in trucks, will continue until adequate facilities, such as pipelines, are in place to allow the direct conveyance of extracted groundwater to holding and/or treatment facilities. The construction and operation of such facilities on BLM land will require the review and approval of BLM. Approval for such facilities will be requested in a separate application at a future time.

PG&E proposed using a batch treatment process as outlined in the *Interim Measures Work Plan No. 2,* dated March 3, 2004 (CH2M HILL 2004a). The goal of batch treatment is to substantially reduce the volume of concentrated hexavalent chromium-bearing groundwater. Batch treatment will increase water disposal options to nearby treatment facilities and reduce risk during transport to the treatment facilities. The remainder of this document describes the regulatory framework, batch treatment process, modifications to the groundwater extraction system, waste management practices, schedule, and mitigation measures.

2.0 Description of Batch Treatment Process

The current interim measures system is sited on a flat bench of land at the MW-20 cluster and consists of six 19,500-gallon storage tanks, piping, secondary containment, operations crew storage and work facilities, and security fencing. PG&E began extracting groundwater into the tanks on March 8, 2004. Groundwater is pumped from the tanks into trucks, which haul the water to the US Filter's licensed hazardous waste treatment and disposal facility in Los Angeles, California. Extracted groundwater contains hexavalent concentrations exceeding the toxicity characteristic threshold concentration for hazardous waste, requiring that the waste be treated and disposed of at a licensed hazardous waste treatment facility. At current pumping rates, five to six trucks are required to make daily trips to the treatment facility to remove the accumulated groundwater from the tanks. These trucks log more than 8,000 miles per week in hazardous waste transport.

Integrating batch treatment with the interim measures would result in greater than a 99 percent reduction in the volume of hazardous waste generated at the extraction site. The batch treatment activities involves:

- Developing a planning and approval process for system modifications to incorporate batch treatment within the existing holding tanks.
- Modifying the existing system.
- Extracting groundwater from extraction wells TW-2S and TW-2D.
- Treating the extracted groundwater on site.
- Transporting and disposing the treated groundwater.
- Transporting and disposing sludge from the clarifier.

Figure 1 shows the MW-20 bench location with the existing tank system and the batch treatment equipment. Figure 2 schematically shows the components of the batch treatment process.

2.1 Regulatory Framework for On-site Treatment

In California, hazardous waste treatment falls under both California and federal law. Because PG&E will be treating the extracted groundwater in tanks, and the groundwater is hazardous solely due to the presence of inorganic constituents at concentrations above the toxicity characteristic threshold, the statute (Section 25200.3 of the California Heath and Safety Code) allows hexavalent chromium treatment (reduction to trivalent chromium) to be conducted pursuant to a grant of conditional authorization (without obtaining a hazardous waste facilities permit), provided that certain conditions exist. The conditional authorization for reduction of hexavalent chromium in solution requires that the pre-treatment concentration of hexavalent chromium be less than 750 milligrams per liter (mg/L) and that treatment be conducted using one of a specified list of reagents (including ferrous chloride).

California has delegated permitting authority to a local agency referred to as the Certified Unified Program Agency (CUPA). The CUPA for the Topock site is the San Bernardino County Fire Department. Notice of intent to treat waste under a conditional authorization must be made to DTSC and the applicable CUPA not less than 60 days before undertaking such treatment. The statue provide that DTSC may allow treatment to begin within a shorter time period, upon showing of good cause by the generator (and provided that all other permits and authorizations have been obtained).

PG&E provided notice of its intention to treat under a conditional authorization by letter to the San Bernardino County Fire Department dated April 13, 2004. The Fire Department acknowledged receipt of the notification by letter to PG&E dated April 14, 2004. The conditional authorization forms were submitted to the CUPA (Attachment A), and the CUPA verbally authorized the project on April 14, 2004. Appendix B contains a copy of the approval letter sent by the CUPA. PG&E's understanding is that DTSC has no objection to a reduction in the 60-day notice period pursuant to California Health and Safety Code Section 25200.3(e)(2), provided that the CUPA concurs with such a reduction, given the significant environmental benefits associated with batch treatment at this site, including a need to protect the Colorado River.

Activities at the BLM Groundwater Extraction Site are being conducted in compliance with various federal, state, and local requirements for environmental protection. Because groundwater extracted at the site exceeds the hazardous waste regulatory threshold for hexavalent chromium, management of site groundwater accumulated in on-site tanks (for less than 90 days) is in compliance with hazardous waste generator standards, including the preparing an emergency preparedness and contingency plan, implementing a training program, conducting regular inspections, and performing various record-keeping and reporting practices. Each of these plans and control measures will be updated, as appropriate, upon implementation of the batch treatment process.

2.2 Benefits of Batch Treatment

There are several benefits to batch treatment of extracted groundwater at this site, including risk reduction and flexibility in reuse or discharge.

- **Risk reduction—** Federal and state agency guidance encourages generators including federal facilities to reduce the volume of hazardous waste generated for disposal. By treating groundwater in the tank system, PG&E can reduce the hexavalent chromium concentration below toxicity characteristic threshold concentrations, rendering it non-hazardous. This results in a reduction in volume of hazardous waste produced by over 99 percent and there is an immediate reduction in risk at the MW-20 bench area from spills and leaks. Transporting non-hazardous groundwater also offers less risk of environmental damage in the event of releases during transport from the site to the treatment facility.
- **Flexibility of discharge and reuse options—**Batch treatment is very flexible; it can accommodate a relatively wide range of pumping rates, and the length of treatment can be varied to accommodate reuse or discharge limitations. This allows for evaluation of potentially viable reuse of the treated water.

In summary, operating a batch treatment process significantly reduces environmental risks during trucking and storage, reduces the volume of hazardous waste generated, and requires only minimal modifications to existing facilities.

2.3 Modifications to the Existing Tank System

As outlined in the IMWP No. 2 (CH2M HILL 2004a), batch treatment would take place in the tanks in use at the MW-20 bench. The tanks would be retrofitted with internal piping and devices (venturi eductors) to ensure proper mixing of the groundwater with reducing and precipitating agents. Equipment to be procured includes a clarifier, or settling vessel, with the following dimensions: approximately 21 feet high, 7.5 feet wide, and 15 feet long. Within the clarifier there are two components; the settling chamber where the solids begin to settle and the thickener where the sludge forms. A filter may be used as an optional step to further remove particulates from the treated water. The clarifier and all other associated system piping, instrumentation, and controls would be installed within the footprint of the existing fenced extraction facilities. PG&E proposes to store the reducing agents (25 to 40 percent solution of ferrous chloride) and pH control chemicals (35 percent solution of sulfuric acid and 25 percent solution of sodium hydroxide) at the compressor station. If necessary, hydrogen peroxide (28 to 35 percent solution) may be stored on site for use in iron removal. Only one 55-gallon drum of each of the three reagents used in the treatment process would be stored at the treatment system location within the area protected by the containment berms. When the drums of reagents are empty, they would be removed and replaced with full drums brought from the compressor station. Re-circulation pumps on each of the two batch treatment tanks would be used to ensure sufficient mixing of the chemicals and groundwater to complete the treatment reaction.

2.4 Treatment of Extracted Groundwater

2.4.1 Process Chemistry Details

The treatment involves reducing the hexavalent chromium to the less soluble trivalent form by reaction with ferrous chloride in a solution made slightly acidic through the addition of sulfuric acid. Following that reaction, the addition of sodium hydroxide precipitates iron and trivalent chromium. The water and precipitated solids then are pumped from the tanks into a clarifier, where the majority of precipitated solids would be removed by gravity separation. Solids separated from the water stream in the clarifier will be contained in 400-gallon tote-style containers (up to four totes will be sited). Additional solids removal may be provided by passing the clarified water through an additional filtration step, such as a sand filter or microfilter. The treatment goal for the effluent is less than 1 mg/L for total chromium.

The reaction between hexavalent chromium and ferrous iron is:

$$H_xCrO_4^{x-2}(aq) + 3Fe^{2+}(aq) + iH_2O \leftrightarrow Cr(OH)_y^{3-y}(aq) + 3Fe(OH)_z^{3-z}(aq) + jH^+ \quad (1)$$

(Cr^{+6}) (Fe^{+2}) (Cr^{+3}) (Fe^{+3})

where $i = (y + 3z)$ and $j = (x + y + 3z)$.

The reaction proceeds quickly, and the reaction kinetics or rate of reaction comes from the following relationship (*Environ. Sci. & Technol.*, Volume 30, No. 5, 1996, pp. 1614 – 1617):

$$\frac{d[Cr(VI)_t]}{dt} = -k_{Cr}[Fe(II)]^{0.6}[Cr(VI)_i]^{1.0} \quad (2)$$

Where:

k_{Cr} = 56.3 millimole$^{-0.6}$ minute^{-1} L$^{0.6}$.

[Cr(VI)] = hexavalent chromium, millimole/L.

[Fe(II)] = initial Fe(II), millimole/L.

i and t = subscripts indicating **i**nitial and elapsed reaction **t**ime, respectively.

Tables C-1 and C-2 of Appendix C show influent and effluent water quality concentrations for nominal and maximum cases, respectively.

2.4.2 Operational Details

The treatment of extracted groundwater will be performed in batch mode. Two of the existing holding tanks will be used as batch treatment tanks. The batch treatment cycle is conducted as follows: groundwater is pumped into an existing holding tank used as a receiving tank and is then pumped into one of the two treatment tanks. When the treatment tank is full, the operator starts the treatment process. The pH of the tank is lowered by the addition of sulfuric acid. Ferrous chloride is pumped into the treatment tank, and the tank mixing pumps circulate the water throughout the tank.

Sodium hydroxide then is pumped into the treatment tank at a rate sufficient to raise the pH to a target range of 7.5 to 8.2. Increasing the pH precipitates the iron and chromium as hydrous iron oxide and chromium hydroxide, respectively.

The treatment tank contents are field screened to ensure that treatment has been effective. Upon confirmation that the treatment goal has been met using a HACH kit (colorimetric testing to measure chromium concentrations), the water and precipitated solids are pumped to a clarifier for settling. At the end of the treatment cycle, the water that is pumped through the clarifier is conveyed to the treated water storage tank. The treated water is then pumped from this holding tank into trucks for transport to an off-site treatment or disposal facility.

Periodically, the tote (sludge container) will be removed, and the contents will be disposed of in a licensed off-site treatment and disposal facility. Calculated sludge generation rates are about 625 pounds per week, assuming an influent concentration of 7.5 mg/L of hexavalent chromium at 17 gallons per minute of flow. Up to four totes will be present on site to ensure continuous system operation.

2.4.3 Operators

Site operators will be responsible for daily operation of the system. Each operator will be trained on proper operation of system equipment, field instruments and monitoring equipment, appropriate documentation, and will be familiar with the normal operating ranges of system components. The operator will also have the necessary training for hazardous waste operations. The pumping and storage system will be equipped with automatic shutoffs to prevent tank overflow and pipe failures. The automatic shutoffs combined with site inspection will provide operational reliability and safety.

System operations and maintenance (O&M) will be completed by the site operators. The site operator will record O&M activities in designated field log books, daily logs, and inspection forms, in the same manner outlined in IMWP No. 2 (CH2M HILL 2004a).

2.4.4 Site Security

The current system offers security to safeguard against vandalism and injury. During setup of the batch treatment equipment, all appropriate security measures will be implemented for the express purpose of providing safety to operators and the public. These measures include:

- Maintaining appropriate staffing during operations until security measures can be installed.
- Maintaining a visitor log to document person(s) accessing the property.
- Maintaining site security fencing consisting of 6-foot-high, steel chain-link fabric and post-construction enclosing all extraction, storage, and treatment facilities and appurtenances. Access is through locked truck and personnel gates in the fencing. Access for trucks is available 24 hours per day, although every effort will be made to schedule all truck loading and shipments to occur during daylight hours.
- Posting warning signs (e.g., no trespassing, safety hazard signs) at several locations on each leg of the security fence.

The Environmental Compliance Plan, submitted as an addendum to the IMWP No. 2 (CH2M HILL 2004b), contains details on the language of warning signs, their number, and specific placement on the fence, as well as the types, locations, and sizes of gates and locks to be used. The site security measures will be inspected and maintained as necessary during system operation.

2.4.5 Emergency Response

Spill containment equipment (e.g., sorbent materials, shovels, etc.) will be maintained on site at all times. As a contingency in the event of a leak from the storage tank or equipment (vacuum trucks, pumps, etc.), trained spill response personnel will be on call 24 hours per day. PG&E will retain the services of a spill response contractor who will have the capability to mobilize to the site within 2 hours, if needed. As an added contingency, the Topock Compressor Station is manned 24 hours per day. Emergency response procedures, including the identification of the on-call spill response contractor, are provided in the Environmental Compliance Plan.

2.5 Documentation and Reporting

The following documentation and reporting activities are proposed to effectively communicate the batch treatment system operation and effectiveness. This is consistent with the proposed documentation described in the IMWP No. 2 (CH2M HILL 2004a).

- **System operations documentation:** Logs and forms will be used to record information on the operational status of the system, including system runtime(s), flow data, sampling/waste characterization data (as available), transportation and disposal information, system troubleshooting, site security, and maintenance activities. System operations notes and forms will be compiled and summaries made available monthly to DTSC as part of the performance monitoring reports (see below).
- **Performance monitoring reports:** Bi-monthly performance reports will be expanded to include batch treatment system operational and performance data.

2.6 Indemnity

PG&E agrees to indemnify and hold harmless BLM, its agents, and employees from any and all claims or causes of action arising from or on account of acts or omissions of PG&E, its employees, successors, agents, contractors, subcontractors, or other persons, in carrying out activities under this Batch Treatment Work Plan. PG&E further agrees that the United States, and its agencies and employees, shall not be held as a party to any contract entered into by PG&E in carrying out activities under this work plan.

3.0 Project Schedule

The table below shows the proposed project schedule with estimated duration of many critical activities. System operations reports will be submitted as discussed in Section 2.5. Performance monitoring reports are being submitted on the 1st and 15th of each month. Future modifications of the groundwater extraction system for the comprehensive interim measure are not shown in this schedule. PG&E's ability to meet this schedule is dependent upon BLM's authorization of the interim measure through the issuance of an Action Memorandum as a time-critical removal action under CERCLA. Without this authorization, PG&E does not have permission to install any batch treatment system equipment.

Activity	Duration	Start	Finish
Batch Treatment Work Plan and Agency Review	**20 days**	**4/21/04**	**5/11/04**
Prepare Draft	10 days	4/21/04	4/30/04
DTSC Review	5 days	4/30/04	5/5/04
BLM Review	5 days	4/30/04	5/5/04
Final to DTSC and BLM	5 days	5/6/04	5/11/04
Agency Authorization	**3 days**	**5/11/04**	**5/14/04**
BLM Authorization	3 days	5/11/04	5/14/04
DTSC Authorization/CEQA Exemption	3 days	5/11/04	5/14/04
System Installation	**14 days**	**5/14/04**	**5/28/04**
System Modification	11 days	5/14/04	5/25/04
System Startup and Testing	3 day	5/25/04	5/28/04

4.0 Waste Management Practices

This section describes the waste management practices for the waste streams anticipated for batch treatment operations. The primary waste streams generated from batch treatment are treated groundwater and sludge.

Based on the current pumping rates, up to 25,000 gallons of water are expected to be generated daily. Extracted groundwater will be pumped from the wells to the receiving tank. The holding tanks and associated piping will meet state and federal requirements for storage of hazardous waste in tank systems (e.g., secondary containment).[1] Representative samples of the treated groundwater will be collected and analyzed at least weekly to determine chromium concentrations. As necessary, additional analyses will be performed to fine-tune the batch treatment system and/or meet requirements of the treated water and/or sludge disposal facilities.

Following treatment, the water will no longer be considered hazardous. The treated water will be pumped to vacuum trucks for transportation off site. It is anticipated that the treated water storage tank will be emptied daily. The hazardous waste generated on site, including the precipitated chromium sludge, will be periodically removed for disposal and will not exceed 30 days of generation (in compliance with the hazardous waste generator standard of less than 90 days).

Additional hazardous waste management practices include:

- Labeling tanks to include the tank number, contents, designation as hazardous waste (if appropriate), and the National Fire Protection Association hazard warning "fire diamond."
- Performing daily inspections of the tank systems,[2] which includes tanks, piping, and pumps.
- Performing periodic inspections of emergency equipment.[3]
- Training personnel in hazardous waste management, commensurate with their responsibilities.[4]
- Preparing procedures for responding to unplanned releases, etc.[5]

The Environmental Compliance Plan describes the practices listed above, and copies of the plan are maintained on site. The plan will be updated to address batch treatment of chromium and storage of associated chemical reagents. This plan will include copies of permits, forms, and procedures for environmental practices at the site ensuring compliance

[1] 22 CCR Section 66262.34 and Section 66265.190 et seq.
[2] 22 CCR Section 66262.34 and 66265.195
[3] 22 CCR Section 66262.34 and 66265.33
[4] 22 CCR Section 66262.34 and 66265.16
[5] 22 CCR Section 66262.34 and 66265.30-37

with federal, state, and local requirements. The primary focus of the Environmental Compliance Plan is hazardous materials and waste management. It addresses the requirements of the CUPA (San Bernardino County Fire Department) for a Business Plan, including spill prevention and response measures and manifesting of hazardous waste.

A United States Environmental Protection Agency Spill Prevention, Control and Countermeasure Plan is not required because the oil storage capacity will not exceed 1,320 gallons. Fuel used in the diesel generator is the only petroleum product present on site. Spill prevention and control measures for the fuel is addressed in the (Hazardous Materials) Business Plan, prepared in accordance with the requirements of the local CUPA.

Personal protective equipment and disposable sampling equipment designated as non-hazardous waste will be double-bagged and disposed of in dumpsters at the station. In the unlikely event that such equipment is ever designated as hazardous waste, it will be disposed of at a permitted facility in compliance with all hazardous waste regulatory requirements.

5.0 Mitigation Measures

At a minimum, the following restrictions and controls related to protection of biological and cultural resources will be complied with in implementing batch treatment. These measures were initially presented in the IMWP No. 2 (CH2M HILL 2004a) and are reproduced here.

1. The Mojave population of the desert tortoise is federally protected as a threatened species under the Endangered Species Act of 1973 and is protected by California law. Prohibited actions include capture, handling, harassing, collecting, injuring, or destroying animals or their burrows. Any sightings of desert tortoise must be reported immediately to the BLM Lake Havasu Field Office Wildlife Biologist.

2. All personnel are to report any sightings of desert tortoise, bighorn sheep, other wildlife species and federally listed migratory birds (such as bald eagle, brown pelican, etc.) to the BLM Lake Havasu Field Office, Wildlife Biologist.

3. If a desert tortoise is endangered by any activity, that activity will cease until the desert tortoise moves out of harm's way on its own accord. A desert tortoise that needs to be handled, to prevent injury or death, must be handled by a certified/qualified handler only.

4. The area within the fence will be inspected at least every four hours during periods when the gates are open for desert tortoise that may become trapped inadvertently within the enclosure. All vehicles stationary for 15 minutes or longer will be inspected underneath for desert tortoise prior to moving. In the event that a tortoise is found within the fenced area or under a vehicle, that tortoise will be handled only by a certified handler.

5. All native riparian species (e.g., cactus, ocotillo, mesquite, Palo Verde, etc.) will be avoided at all times. California-listed sensitive species of plants can be trimmed but not removed.

6. All construction trash and/or debris will be removed.

7. All vehicles must stay on the existing and approved routes. No vehicles are authorized to drive in the existing washes.

8. PG&E will notify immediately the BLM Lake Havasu Field Manager (or his designated representative) of any cultural resources (prehistoric/historic sites or objects) and/or paleontological resources (fossils) encountered during permitted operations and will maintain the integrity of such resources pending subsequent investigation. All operations in the immediate area of the discovery must be suspended until written authorization from BLM to proceed is issued. An evaluation of the discovery shall be made by a qualified archaeologist or paleontologist to determine appropriate actions to prevent the loss of significant cultural or scientifically important paleontological values.

9. No permanent improvements that affect the integrity of the bridge/culvert over Bat Cave Wash on historic Route 66 will be implemented. This feature has been analyzed by

a structural engineer to determine if there will be any adverse effects as a result of transporting the pumped water from the MW-20 bench via truck. Caltrans maintenance records indicate that the structure has an operation rating that exceeds the anticipated load of the haul trucks.

10. Actions that result in impacts to archaeological or historical resources are subject to the provisions of the Archaeological Resources Protection Act of 1979, as amended, and the Federal Land Policy and Management Act of 1976.

6.0 References

CH2M HILL. 2004a. *Interim Measures Work Plan Number 2, Topock Compressor Station, Needles, California.* March 3.

_____. 2004b. *Addenda to Interim Measures Work Plan Number 2, Topock Compressor Station, Needles, California.* March 3.

Figures

LEGEND

- Evacuation Route
- ERE — Emergency Response Equipment
- FE — Fire Extinguisher
- Gate
- MSDS BEP — Material Safety Data Sheets & Business Emergency Plan
- Valve
- Fence
- ① Receiving Tank
- ② Batch Treatment Tank #1
- ③ Batch Treatment Tank #2
- ④ Treated Water Storage Tank
- ⑤⑥ Receiving or Treated Water Storage Tank
- Ⓐ 55-Gallon Drum of Sulfuric Acid Solution
- Ⓕ 55-Gallon Drum of Ferrous Chloride Solution
- Ⓒ 55-Gallon Drum of Sodium Hydroxide Solution

NOTES

1. EXACT LOCATION OF CLARIFIER, 55-GALLON DRUMS, FILTER AND TOTE CONTAINERS WITHIN THE CONTAINMENT AREA WILL BE DETERMINED IN THE FIELD.

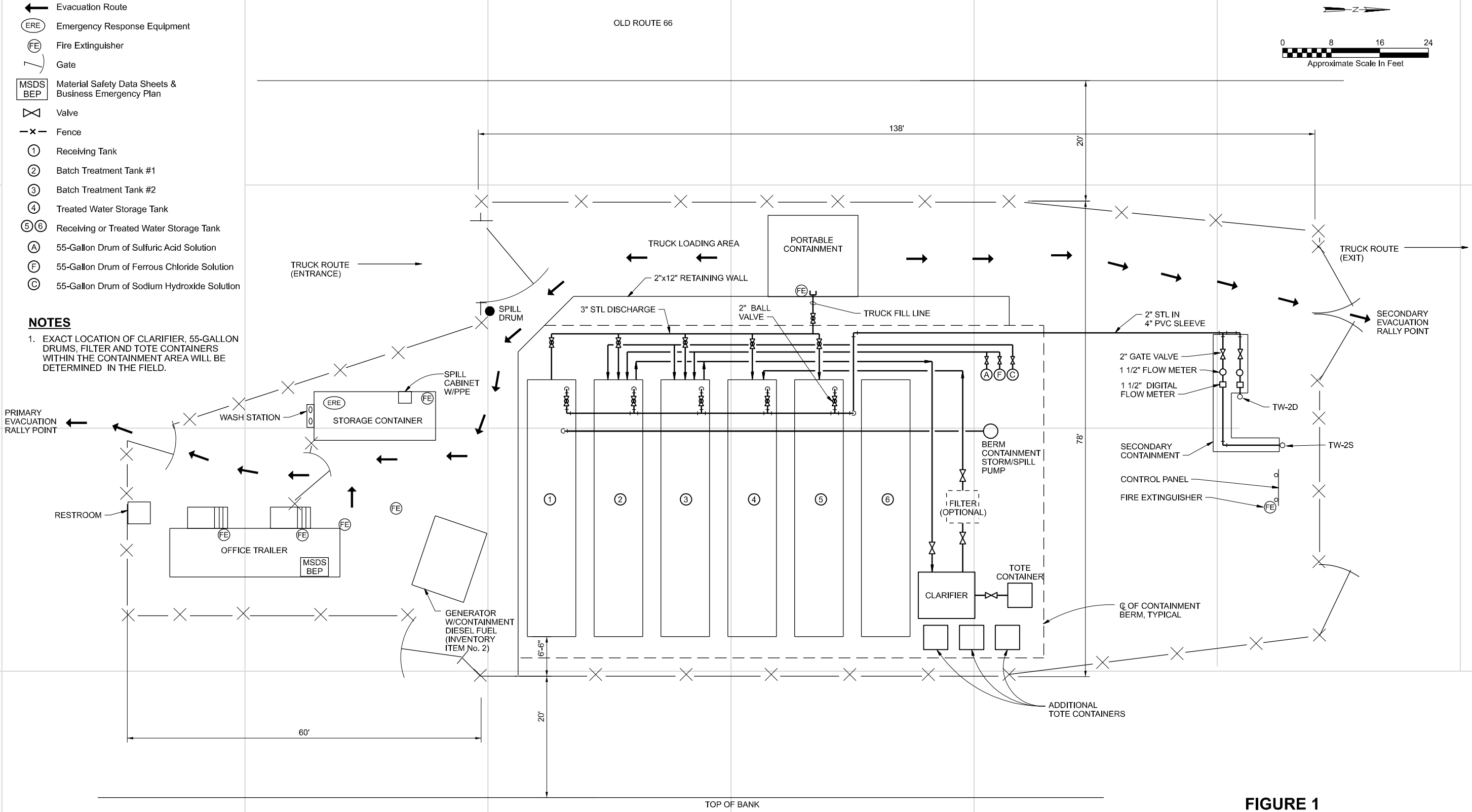

FIGURE 1
FACILITY MAP
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

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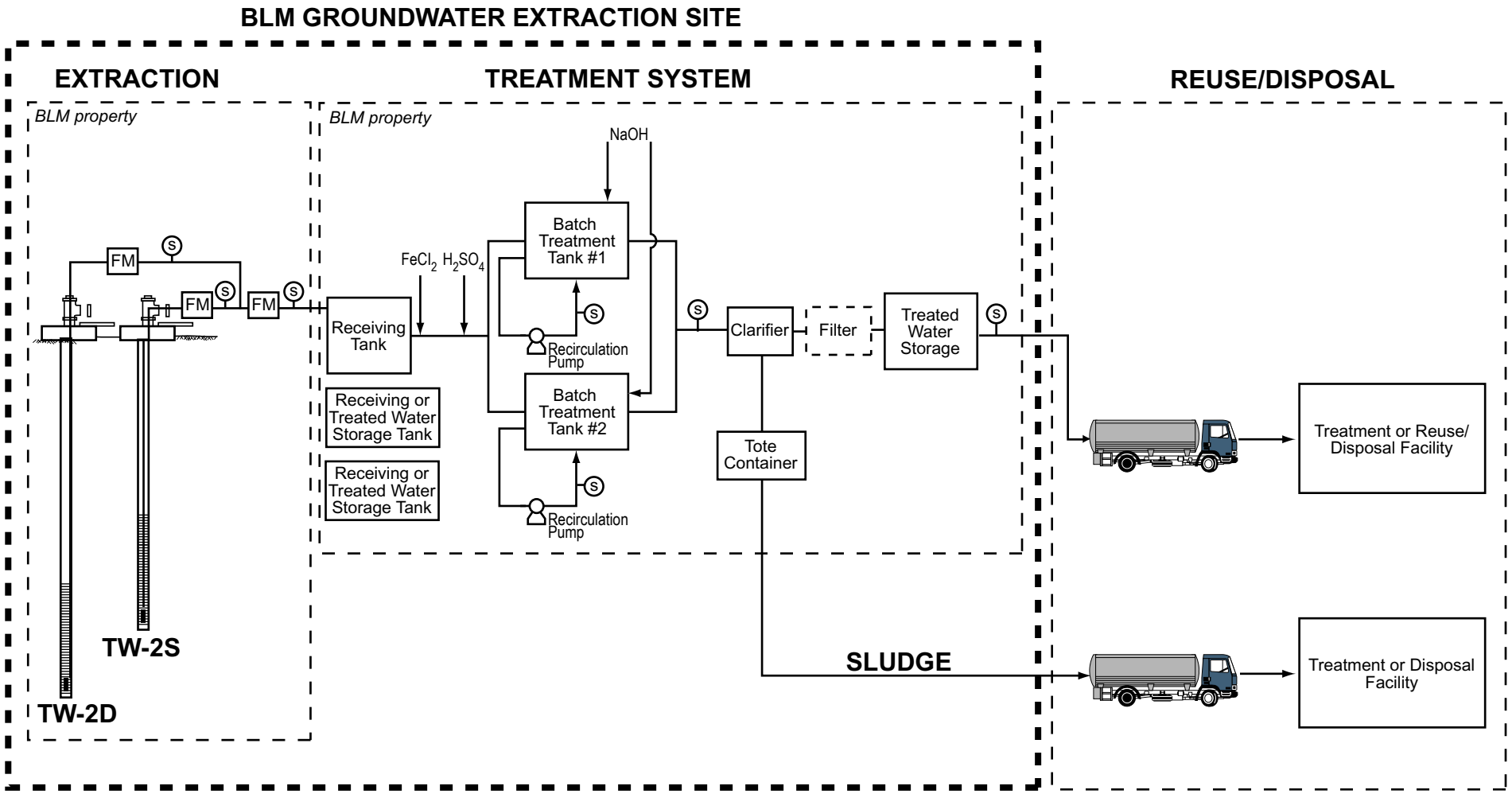
NDM:PGE SITE REMED\DELIV\TOPOCK SITE02.DGN 29-APR-2004



LEGEND

FM FLOW METER

S SAMPLE PORT

Notes:

1. Assumes current pumping rate of 16-17 gpm from TW-2S and TW-2D.
2. $FeCl_2$ - Ferrous chloride, reducing agent
   NaOH - Sodium hydroxide, precipitating agent
   H_2SO_4 - Sulfuric acid, pH control
3. A filter (sand or microfilter type) may be installed for additional particulate removal.
4. Two additional storage tanks at the existing extraction will be used as receiving water tanks or for treated water storage as required.

FIGURE 2
BATCH TREATMENT SCHEMATIC DIAGRAM
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

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315024.IM.01_Batch Treatment_4/29/04_ccc

Appendix A
Conditional Authorization Submittal to San Bernardino County Fire Department (separate volume)

Appendix B
Notification of Conditional Authorization from San Bernardino County Fire Department (separate volume)

Appendix C
Influent and Effluent Water Quality Concentrations

TABLE C-1
Nominal Influent and Effluent Stream Compositions
Batch Treatment Work Plan, Topock Compressor Station

	Influent	**Effluent**
Cr(VI), mg/L	7.5	<1
Cr(T), mg/L	8.5	<1
Ca, mg/L	282	282
Mg, mg/L	44	44
Na, mg/L	933	933
K, mg/L	21.4	21.4
Sr, mg/L	5.65	5.65
Ba, mg/L	0.05	0.05
CO_3, mg/L	3.6	0.05
HCO_3, mg/L	161	101.5
SO_4, mg/L	808	836
Cl, mg/L	1,277	1,293
NO_3, mg/L	58.9	58.9
F, mg/L	0.95	0.95
SiO_2, mg/L	18.8	18.8
CO_2, mg/L	4	32.9
∑(ions), mg/L	3,420	3,516
pH	7.8	6.7

TABLE C-2
Maximum Influent and Effluent Stream Compositions
Batch Treatment Work Plan, Topock Compressor Station

	Influent	**Effluent**
Cr(VI), mg/L	19	<1
Cr(T), mg/L	19	<1
Ca, mg/L	851	851
Mg, mg/L	801	801
Na, mg/L	7316	7316
K, mg/L	85.2	85.2
Sr, mg/L	[3.0][a]	[3.0]
Ba, mg/L	[0.05]	[0.05]
CO_3, mg/L	-	[0.05]
HCO_3, mg/L	612.9	223.1
SO_4, mg/L	2,800	3,107
Cl, mg/L	12,233	12,233
NO_3, mg/L	-	-
F, mg/L	-	-
SiO_2, mg/L	[20]	[20]
CO_2, mg/L	6.3	287.6
∑(ions), mg/L	24,722	24,739
pH	7.06	6.1

[a][ ] denotes data unavailable, assumed or estimated concentration.